NATIONAL INSTITUTE OF DENTAL RESEARCH

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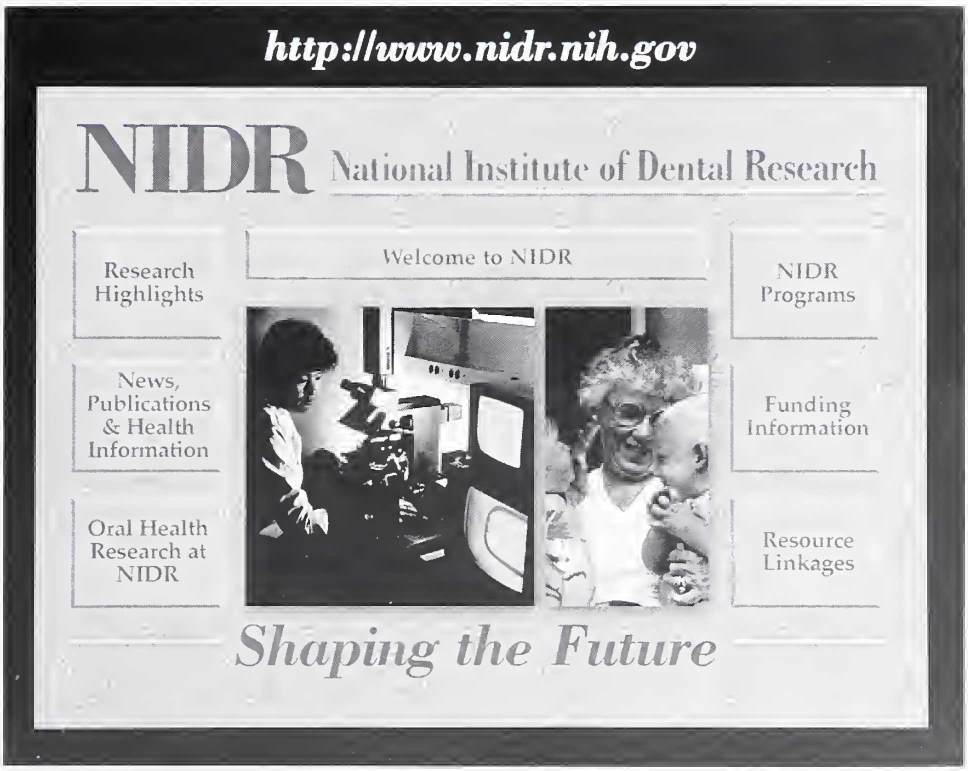

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New Marker for Diabetes Identified

Scientists at the NIDR have identified a protein that is an important marker for Type 1 (juvenile) diabetes, a disease that affects close to one million people in the United States alone. The protein can be used in combination with two other known marker proteins to improve diagnosis of individuals who have diabetes and identify those at risk of developing the disease. This protein and the other marker proteins are also candidates for experimental treatments aimed at preventing the onset of Type 1 diabetes.

The identification of the new marker protein, which was reported in the March 19 issue of the *Proceedings of the National Academy of Sciences*, is part of an ongoing study at the NIDR. Scientists in NIDR's Laboratory of Oral Medicine are investigating the molecular biology of diabetes, a disease known to increase the risk of periodontal disease and tooth loss.

The research, directed by Drs. Abner Notkins and Michael Lan, focuses on Type 1 diabetes, also known as insulin-dependent diabetes mellitus, or IDDM. The disease develops most often in children and young adults and can account for a variety of severe complications, including blindness, kidney and heart disease, neurologic problems, and premature death.

IDDM is an autoimmune disease in which the immune system produces antibodies that attack the body's own insulin-manufacturing cells in the pancreas. Patients require daily injections of insulin to regulate blood sugar levels.

Patient Screening

The destructive autoantibodies are the basis of the existing diagnostic test for IDDM, which reacts patient serum with sections of human pancreas tissue, a labor-intensive procedure. Recently, however, scientists have been able to identify some of the target proteins in the pancreas that react with the autoantibodies and are using this knowledge to improve disease detection and streamline the screening process.

An earlier study by Dr. Lan and his colleagues identified a marker protein called IA-2 that is present in insulin-producing beta cells of the pancreas and belongs to a family of important regulatory molecules known as tyrosine phosphatases. The study reported in the *Proceedings of the National Academy of Sciences* describes a second protein called IA-2 Beta (IA-2β) that is a member of the same family. The genes for both of the proteins have been cloned and sequenced, and genetically engineered versions of the proteins have been produced in the laboratory.

IA-2 and IA-2β, when used in diagnostic tests, recognized autoanti-

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bodies in 70 percent of IDDM patients. Combining IA-2 and IA-2β with a third known marker protein called GAD_{65}, increased the level of identification to 90 percent of individuals with IDDM. Furthermore, the presence of autoantibodies to the marker proteins in otherwise normal individuals was highly predictive in identifying those at risk of ultimately developing clinical disease.

Research Directions

"The identification and production of IA-2 and IA2-β make it possible to develop a rapid and effective test that can screen large populations for IDDM," said Dr. Notkins. "In addition, the proteins are candidates for immune tolerance studies, which attempt to prevent the development of destructive autoantibodies and subsequent disease."

Persons without diabetes also have the marker proteins on their beta cells, but do not make autoantibodies. The scientists are hopeful that the demonstration that IA-2 and IA-2β are major targets of the autoimmune attack will aid in uncovering the actual cause of the disease process.

Investigators on the study were Drs. Jia Lu, Qing Li, Hong Xie, Zhi-Jian Chen, Anna E. Borovitskaya, Abner Louis Notkins, and Michael S. Lan from the Laboratory of Oral Medicine, National Institute of Dental Research; and Dr. Noel K. Maclaren from the University of Florida College of Medicine. ■

--*Wayne Little*

Results of National Oral Health Survey Released

Results from the first phase of a nationwide survey of oral health in children and adults were released in March by the NIDR, providing a snapshot of the nation's dental health status. The survey provides the most reliable estimates yet of dental disease in several population subgroups, including children under age 5, adults age 60 and over, and black Americans and Mexican Americans--the two largest minority groups in the U.S.

What emerges from the first three years, or Phase I, of the 1988-94 National Health and Nutrition Examination Survey--called NHANES III--is a more complete picture of the dental treatment needs of children and adults from Mexican American, non-Hispanic black, and non-Hispanic white backgrounds. The NIDR sponsored the oral health component of NHANES III in collaboration with the National Center for Health Statistics.

"While there has been remarkable improvement in the nation's dental health over the past couple of decades, the survey findings point to many challenges for the American public and the dental community," said NIDR Director Harold Slavkin. "For example, it appears that caries in permanent teeth continues to decline among school-aged children, and that's good news, but the other side of the coin is that 45 percent of children and adolescents still suffer from this preventable infectious disease: there is our shared challenge."

Tooth Decay in Children and Adolescents

NHANES III dental examiners found no caries in the permanent teeth of 55 percent of children and adolescents aged 5 to 17. Only a couple years earlier, a 1986-87 survey had found that 50 percent of 5- 17-year-olds were caries-free in their permanent teeth. The NHANES III survey showed that black children enjoyed the highest caries-free rate in permanent teeth--61 percent, followed by white children at 55 percent and Mexican American children at 51 percent. (White and black refer to people of non-Hispanic white and black backgrounds.)

Unfortunately, tooth decay continues to affect millions of U.S. children and adolescents, with the majority experiencing caries by their late teens. Only 33 percent of 12- 17-year-olds were caries-free in their permanent teeth. Caries in the permanent teeth was not distributed evenly among children and adolescents, the survey showed. Most of the caries--80 percent-- was found in a quarter of the 5- 17-year-olds.

The survey showed that most of the caries (80 percent) in the permanent teeth of children and adolescents had been treated. Although black and white youngsters had about the same amount of caries in their permanent teeth, black children had more than twice as much untreated decay as did white children.

Sixty-two percent of children aged 2-9 had no caries in their primary teeth, the survey found. While caries rates in primary teeth were similar for girls and boys, they increased with age and differed among race-ethnicity groups.

Among 2- 4-year-olds, more white children were caries-free in their primary teeth (87 percent) than either black or Mexican American youngsters (78 percent and 68 percent, respectively). Among 5- 9-year-olds, about half of white and black children had no caries in their primary teeth, while only about a third of Mexican American children were caries-free.

Untreated decay in primary teeth was a major problem uncovered by the survey. Nearly half (47 percent) of the caries in the primary teeth of 2- 9-year-olds had not been treated. Mexican American children had the highest percentage of untreated decay--62 percent, followed by 59 percent for black children and 41 percent for white children.

NHANES III revealed that use of dental sealants more than doubled since 1986-87, but still remained low. The survey found sealants on the primary teeth of less than 2 percent of children, and the permanent teeth of 19 percent of children and adolescents. Use of sealants on permanent teeth was three times as common in white children (22 percent had sealants) as in black children (8 percent) or Mexican American youngsters (7 percent).

Tooth Decay and Tooth Loss in Adults

Tooth decay is nearly universal among American adults. The survey found that 94 percent of people age 18 and older had either untreated decay or fillings in the crowns of their teeth. On average, American adults had 22 decayed, missing, or filled coronal surfaces (out of 128 possible surfaces).

Women had more caries than men (24 decayed, missing, or filled surfaces, versus 21 in men), but they also had slightly less untreated decay. Whites had approximately twice as much coronal caries (24 surfaces) as did blacks (12 surfaces) and Mexican Americans (14 surfaces); however, blacks and Mexican Americans had more tooth surfaces in need of treatment than did whites. Blacks had an average of 3.4 untreated surfaces, Mexican Americans had 2.8, and whites had 1.5.

The survey found root caries in 23 percent of adults. On average, adults had only one decayed or filled root surface. Decay of tooth roots was more prevalent in black and Mexican American adults than in whites. Half the root caries found in white adults had been treated, but most of the root caries in black and Mexican American adults was untreated.

The survey also showed that 10 percent of adults are missing all their teeth. The remaining 90 percent have, on average, 23.5 teeth. Almost a third of adults have all 28 teeth. Gender did not play a role in tooth loss, the survey found, but age and race-ethnicity did. Virtually none of the adults aged 18 to 24 were toothless, but 44 percent of those age 75 and older were missing all their teeth. Mexican American adults had an average of four more teeth than did black or white adults.

Removable complete or partial dentures are a fact of life for millions of Americans, the survey showed. About 20 percent of adults aged 18 to 74 wore some type of removable denture, with use more common in women than men and more common in white adults (22 percent) and black adults (21 percent) than in Mexican American adults (9 percent). As expected, denture use increased with age; half of Americans age 55 and older wore a partial or complete denture. A high percentage of denture wearers--60 percent--reported problems with their appliances.

Treatment Needs

Untreated caries is one indicator of dental treatment needs, but it doesn't tell the whole story. The survey looked at a number of dental conditions that might benefit from treatment, including defective fillings, crowns, and bridges; loss of healthy tooth structure as a result of restorations or trauma; recurrent caries; and damage to the pulp, or soft tissue at the center of the tooth.

They found that more than 40 percent of adults who had teeth--or almost 62 million Americans--had at least one tooth or tooth space that might benefit from treatment. No differences were found by gender or race, but problems did increase with age.

Periodontal Disease in Adolescents and Adults

Periodontal problems continue to plague millions of Americans. NHANES III looked at such key indicators of periodontal disease as attachment loss and bleeding gums. Overall, women had better periodontal health than did men, and whites had fewer periodontal problems than did blacks or Mexican Americans.

The survey found that the prevalence and extent of periodontal attachment loss increased with age. Moderate attachment loss of 3-4 mm was found in 30 percent of 25- 34-year-olds, 63 percent of 45- 54-year-olds, and 80 percent of people over age 65. More severe periodontal destruction--attachment loss of 5 mm or more--was found in 15 percent of those surveyed. Bleeding gums were most prevalent among adolescents; three-fourths of 13- 17-year-olds had gums that bled on gentle probing.

Tooth Trauma and Occlusal Problems

NHANES III was the first national survey to look at the prevalence of tooth trauma in children and adults. The survey found that 25 percent of Americans aged 6 to 50 had sustained some sort of injury to the incisors. The most common injury was a chipped tooth, and trauma was more common in males than in females.

The survey was the first national survey in 25 years to examine problems with occlusion, or positioning and alignment of the teeth. The results show that one-fourth of children and adults aged 8 to 50 had perfect alignment of the front teeth. A comparison of the survey findings to those of a survey conducted in 1966-70 showed a 20 percent increase in adolescents with a normal overbite.

The survey also revealed that 18 percent of children and adolescents and 20 percent of adults had undergone orthodontic treatment. Both malocclusion and orthodontic treatment were more common in whites than in blacks or Mexican Americans.

Note:

Oral health results from Phase I of NHANES III, which was conducted from 1988 to 1991, were reported in the February 1996 *Special Issue of the Journal of Dental Research.* An

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article on dental caries and sealant use in children based on the NHANES data appeared in the March 1996 issue of the *Journal of the American Dental Association.* Data from the second phase of NHANES III, conducted from 1991 to 1994, are not yet available. NHANES III was designed to collect nationally representative data on many aspects of health and nutrition, including oral health.

Abstracts for the papers in the February 1996 *Special Issue of the Journal of Dental Research* can be found on the Internet under the home page for the International Association for Dental Research (address: http://medhlp.netusa.net/iadr/iadr.htm). From the home page, select "Publications Information," then "Journal of Dental Research." Click on "Special Issue (NHANES)" to get a list of the 10 abstracts, then click on the abstract you wish to view.

NIDR to Host Scientific Frontiers Symposium in June

The NIDR will host another of its popular "Scientific Frontiers in Clinical Dentistry" symposiums, June 13-14, 1996. The symposium will be held in the William H. Natcher Conference Center on the National Institutes of Health campus in Bethesda, Maryland. Dentists and health professionals who attend the meeting are eligible to receive 13 hours of continuing education credits.

Cosponsored by the NIDR, the American Association for Dental Research, the American Association of Dental Schools, the American College of Dentists, and the American Dental Association, "Scientific Frontiers" is designed to bring clinicians and researchers together in a discovery of the most current and significant developments in fundamental and applied research today. It also provides a view of dentistry in the future.

Leading scientists will discuss promising new research in periodontics, chemotherapeutics, implants, repair and regeneration of oral tissues, bone augmentation, enamel remineralization, restorative procedures, temporomandibular joint disorders, analgesia for acute and chronic pain, treatment for oral manifestations of HIV infection/AIDS, and links between oral and systemic diseases such as diabetes, osteoporosis, and heart disease. NIDR Director Harold Slavkin will give a presentation on "Dentistry in the 21st Century."

To register for the "Scientific Frontiers" symposium, contact Dina Battle at Conwal Incorporated, 6858 Old Dominion Drive, Suite 200, McLean, VA 22101. Telephone: 800/720-3921. The registration fee is $100; $50 for students. ■

Interest in oral health research on the part of dental practitioners continues to grow, judging by the turnout at previous Scientific Frontiers symposia. The last Scientific Frontiers symposium held on the NIH campus (in 1993) drew more than 700 practicing dentists from 33 states and several foreign countries.

The *NIDR Research Digest* is published periodically by the National Institute of Dental Research. Its purpose is to communicate NIDR research findings and other activities of interest to those working in the field of dental research.

Requests for additional information on NIDR or its programs may be addressed to: NIDR, Public Information and Reports Branch, Building 31, Room 2C35, 31 Center Dr. MSC 2290, Bethesda, MD 20892-2290. Telephone (301) 496-4261.